United Nations E/CN.3/2002/24/Add.2

Economic and Social Council

Distr.: General
8 January 2002

Original: English

Statistical Commission
Thirty-third session
5-8 March 2002
Item 7 (d) of the provisional agenda*
Activities not classified by field: definition and measurement of e-commerce

Developing statistics of e-commerce

Note by the Secretary-General

Addendum

Measuring electronic commerce: the Singapore experience

Report prepared by the Singapore Department of Statistics

Introduction

1. E-commerce offers great potential and opportunities for businesses. Besides providing access to new and bigger markets, e-commerce helps to bring about reduced costs and faster turnaround by streamlining and integrating processes along the entire business value chain.

2. In Singapore, the public and the private sectors have actively promoted internet usage and e-commerce applications. Such efforts, facilitated by an advanced infrastructure with widespread broadband access, have given rise to a proliferation of Internet and e-commerce applications. Those applications have enhanced the adoption of e-commerce as a mode of business transaction and made it an integral part of competitive business strategies.

Collection strategies

3. Recognizing the rapid growth in e-commerce and the urgent need for timely and reliable e-commerce data by government planners and industry players, several data-collection initiatives have been launched. The Singapore Department of Statistics (DOS) introduced the first *Survey on Electronic Commerce* in February 1999 to obtain benchmark e-commerce data from businesses. That survey is now conducted on an annual basis, with extended coverage.

4. Two existing surveys are also extensively used as vehicles to collect e-commerce-related data — the *Survey on Infocomm Usage in Businesses* and *Survey on Infocomm Usage in Households*, conducted by the Infocomm Development Authority of Singapore (IDA) (IDA is the government agency that oversees the information and communication technology (infocomm) sector in Singapore). The different coverage of those two surveys provides information on e-commerce activities among businesses and households. To a lesser extent, e-commerce data items are also incorporated in the DOS *Annual Surveys on Commerce and Services* and *Monthly Retail Sales Survey*.

* E/CN.3/2002/1.

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5. Since the collection of e-commerce statistics is a relatively recent phenomenon, DOS organized a conference on the measurement of e-commerce in December 1999 to provide a forum for national and international statistical compilers, academics and users to share their knowledge on the measurement of e-commerce.

E-commerce definition

6. DOS has adopted a definition of e-commerce which covers both e-commerce transactions and e-commerce infrastructure/supporting services.

7. E-commerce transactions are defined to include any form of commercial transactions of goods and services of any kind conducted over computer networks. It includes buying and selling of products and services over open networks (Internet) and closed (exclusive) networks.

8. E-commerce infrastructure/supporting services comprise the following three components:

(a) *Internet application infrastructure services* refer to services or products that build upon the Internet Protocol (IP) infrastructure and make it technologically feasible to perform business activities online. In addition to software applications, this layer includes the human capital involved in the deployment of e-commerce and e-business applications. Examples are search engines, web development, web databases and payment software;

(b) *Internet infrastructure services* refer to services or products needed to create an IP-based network infrastructure. Examples are network services, hosting services and end-user networking equipment;

(c) *Internet intermediary services* refer to products or services that facilitate the meeting and interaction of buyers and sellers over the Internet. Examples are web content/portal providers, online business-to-business exchanges/marketplaces, portal aggregators, online brokerages, online travel agents, Internet advertising brokers and online advertisers.

Business electronic commerce

Survey on Electronic Commerce

9. The rapid growth of e-commerce activities has precipitated the need to determine the value of such transactions. The *Survey on Electronic Commerce* was thus launched to gauge the extent and volume of e-commerce transactions in all industries, as well as the size of e-commerce infrastructure/supporting industries. Since it was a new survey, we faced relatively less restrictions (than if we were to incorporate new questions in existing surveys) and were able to design a survey to collect a comprehensive array of e-commerce data items.

10. The following information on the nature, volume and composition of e-commerce transactions, as well as information on infrastructure supporting services, is obtained from the survey:

- Extent of e-commerce adoption by establishments;
- Types of e-commerce activities undertaken by establishments;
- Business-to-business and business-to-consumer e-commerce revenue and transactions;
- Contribution of e-commerce revenue to total revenue;
- Breakdown of e-commerce transactions by resident and non-resident buyers;
- Major countries with which companies conduct e-commerce transactions;
- Type of payment modes for e-commerce transactions;
- Spending on e-commerce development and infrastructure;
- Barriers to implementation of e-commerce.

11. Findings from the survey showed that an estimated 10 per cent of Singapore's top companies (by revenue and major information technology (IT) players) engaged in e-commerce activities in 2000, compared with 4 per cent in 1999. E-commerce transactions have also increased significantly over the past few years. While business-to-business e-commerce sales increased from $5.7 billion in 1998 to $40 billion in 1999 and an estimated $92 billion in 2000, business-to-consumer e-commerce sales increased from $36 million in 1998 to $200 million in 1999 and an estimated $1.2 billion in 2000.

12. A survey frame on e-commerce firms was not available when the first e-commerce survey was conducted in 1999. By design, the following two

groups of firms were specifically selected to be surveyed instead:

- Top 1,000 enterprises in Singapore (based on turnover);
- Major 1,000 firms engaged in the provision of IT services, including e-commerce infrastructure and supporting services.

13. The two groups were selected on the basis of their large turnover and greater likelihood of participating in e-commerce activities/transactions. The top 1,000 enterprises accounted for 65 per cent of turnover in the economy, while the 1,000 major IT firms accounted for 70 per cent of the turnover of all firms engaged in the provision of IT services. Since the two groups selected for the first e-commerce survey did not constitute a representative purposive sample, the limitation was that the survey results could not be used to provide unbiased estimates of the extent and volume of e-commerce transactions in the economy.

14. A significant improvement was made in the e-commerce surveys conducted in 2000 and 2001 through the expansion of survey coverage to include establishments that were not known to engage in e-commerce and that were not large establishments. Those recent surveys, conducted in collaboration with IDA, covered an increased number of about 9,000 establishments each. The surveyed companies comprised two groups. The first group comprised companies that were known to engage in e-commerce activities, while the second group of companies were selected using stratified random sampling from the establishment register. The inclusion of the second group of companies enabled the survey results to be used for obtaining unbiased estimates of the whole economy.

Survey of Infocomm Usage in Businesses

15. The *Survey on Infocomm Usage in Businesses* was started in the 1980s to assess the extent and sophistication of infocomm usage by companies in the major economic sectors in Singapore. The survey findings provide useful inputs for the Government to formulate appropriate policies to help companies adopt and exploit IT in order to stay competitive in the knowledge economy. The survey questionnaire is regularly reviewed to ensure that the data items remain relevant in line with the change in infocomm technologies.

16. The survey was previously conducted on an ad hoc basis. From 1999 onwards, it was conducted every year. The 2000 survey, covering about 1,200 establishments, collected the following key indicators:

- Extent of computerization among establishments;
- Extent of Internet access;
- IT infrastructure in establishments:
  - LAN utilization;
  - Internet access;
  - Home page creation;
  - Activities/services available on home page;
- Barriers to adoption of IT and e-commerce in establishments;
- IT spending in establishments.

17. To better understand the status and readiness of businesses to adopt e-commerce, the following questions have been incorporated in recent years:

- Status and readiness of businesses to implement the various types of e-commerce, either as provider or consumer;
- Ratings of major factors motivating companies to adopt e-commerce;
- Ratings of possible e-commerce impact on companies (e.g., cost reduction, reach new suppliers/customers, service improvement).

18. Latest survey findings show that the most important motivating factors for using e-commerce on Internet by establishments are to improve service quality and to reduce cost. Surveyed companies felt that Internet e-commerce has had a very positive impact on expansion of customer relations and improvement of service quality, especially for large firms.

Other establishment surveys

19. Other than the *Survey on Electronic Commerce*, data on e-commerce transaction volume are also compiled from other existing surveys. For instance, questions on business-to-business/business-to-consumer and electronic retailing (e-tailing) transaction values have been introduced in the DOS *Annual Surveys on Commerce and Services* and

Monthly Retail Sales Survey, respectively, allowing such data to be collected from more than one source.

Survey frame of e-commerce establishments

20. Following the successful completion of the first e-commerce survey, DOS began to build a more comprehensive survey frame of firms engaging in e-commerce activities from the survey data. Screening questions have been introduced in other existing establishment surveys to identify firms that engage in e-commerce activities, particularly the newly registered ones. This survey frame serves as a population base for conducting e-commerce related surveys.

Household electronic commerce

Survey on Infocomm Usage in Households

21. First conducted in 1990, the *Survey on Infocomm Usage in Households* is the main source of data on infocomm usage in households. The objective of the survey is to gauge the ownership and usage of infocomm appliances, as well as subscription to infocomm services, in households. The sophistication and extent of adoption and usage are also covered. The following key indicators are obtained from households:

- Proportion of home personal computer (PC) ownership/Internet and broadband access;
- Demographic characteristics of home PC/Internet users;
- Extent and sophistication of home PC/Internet usage;
- Ownership of other infocomm products, e.g., personal digital assistants (PDAs), cellular phones and smart card readers;
- Barriers to home PC ownership, Internet access and online IT usage.

22. Like the *Survey of Infocomm Usage in Businesses*, the data items in this survey are regularly reviewed. As e-commerce gains popularity, the following e-commerce-related data have also been incorporated into the survey in recent years:

- Extent of online shopping among Internet users;
- Frequency of online shopping transactions and the transaction value;
- Type of products/services acquired using online shopping;
- Mode of payment used for online payment;
- Reasons for not doing online shopping.

23. Latest survey findings showed that three out of five homes (61 per cent) had at least one computer in year 2000, with nearly one quarter (23 per cent) of households having more than one computer. Half of Singapore homes had Internet access, about six times higher than the proportion in 1996 (8.6 per cent), when such data were first collected.

24. There were an estimated 1.9 million computer users (47 per cent of the total population), of whom 1.3 million were Internet users. E-mail/chat and information retrieval were found to be the two most popular uses of Internet, while only 16 per cent of Internet users aged 15 years and above had ever shopped online. However, online shopping was ranked the third most frequently accessed application/service (not necessarily accompanied by Internet purchase) by Internet users, suggesting that the application has potential for growth.

25. Previously conducted every three years, the survey frequency has been increased to once a year since 1999 to track the salient changes and trends on a more timely basis given the rapid development of infocomm technologies. The 2000 survey covered 1,500 households, using a two-stage stratified sampling design. Previously, only households were enumerated in the survey. With effect from the 2000 survey, individual PC users in surveyed households aged 15 years and above are also enumerated, with emphasis on their Internet usage, which has increased the range of data that can be generated. Internet usage by individual characteristic (e.g., gender, age, education) can now be generated and analysed.

Challenges in measuring e-commerce

26. There was not much difficulty in collecting e-commerce-related data from the two surveys on IT usage in households and businesses since the questions are mostly qualitative in nature and can be easily understood by respondents. The problems in data collection pertain more to the e-commerce survey, where e-commerce transaction values need to be measured. Some of those problems are highlighted below.

Identification and classification of e-commerce firms

27. One of the problems faced was the identification of firms engaging in e-commerce activities. Companies that have incorporated e-commerce into their existing operations may not be identifiable from other firms in the same industry by the industrial classification, one of the key classifications maintained in the DOS business register. For instance, if a retailer conducts online sales, it will still be classified as a retailer and cannot be distinguished from other retailers by the industrial classification. To build up the survey frame of e-commerce firms, DOS has used previous years' e-commerce survey findings and introduced screening questions in other establishment surveys.

Non-availability of information

28. Since e-commerce is still a fairly recent phenomenon and its composition of overall transactions is still relatively small in most companies, some companies have not started to maintain separate records for e-commerce transactions, so that such companies have difficulty in furnishing the relevant e-commerce data.

29. Some companies that are very established in e-commerce transactions may also face difficulty in providing the data; this can happen if the network and web site where the transactions are made are hosted or maintained by parent companies located outside Singapore. Under such circumstances, local subsidiaries may not be able to furnish the relevant data, especially the detailed breakdown of transactions.

Quantifying the value and benefit of e-commerce

30. Quantifying the benefits of e-commerce is an even more daunting task. Cost reduction, convenience, cheap and easy access to large volume of information etc. are benefits of e-commerce. While those estimates are vital to the assessment of e-commerce and provide a good insight into why e-commerce is so widely sought after, they are difficult to quantify. Thus, our estimate of e-commerce activities is confined to companies' transactional value.

Creating an e-Government

31. E-commerce is not confined to businesses and households in Singapore. The Government actively promotes electronic transactions between government agencies and the public. In 2000, the Government of Singapore unveiled a S$1.5 billion plan to transform itself into an *e-Government*. Under the plan, electronic service delivery of government services would be given a further boost. To provide a single window to public services, a special web site known as the *e-Citizen Centre*, has also been set up, where services are organized according to life events rather than by departments and agencies.

32. Today, Singaporeans have access to more than 600 online services, ranging from e-filing of income taxes to online registration and renewal of driving licences. Other than electronic service delivery, the *e-Government* plan also aims to harness infocomm technologies to create new capacities and capabilities. For instance, the Government of Singapore network has been broadband enabled to allow public sector officers to access systems and information easily.

Concluding remarks

33. DOS has built up an array of e-commerce indicators by incorporating additional data items in existing surveys and even launching a dedicated e-commerce survey. The frequency of relevant surveys has been increased to improve data timeliness.

34. The Singapore experience has highlighted some useful lessons. It is imperative, for example, to have an appropriate sampling frame for e-commerce surveys and good sample design. Efforts are continuing in DOS to develop a comprehensive list of companies engaged in e-commerce transactions and provision of e-commerce infrastructure and support. The difficulties encountered in data collection have also provided opportunities for DOS to improve the survey operations. There are plans to collect business-to-business and business-to-consumer e-commerce transaction values, which are currently available on an annual basis, on a quarterly basis. New e-commerce indicators would be developed in response to the change in the e-commerce landscape.

References

Infocomm Development Authority of Singapore, *Electronic Commerce in Singapore* (http://www.ida.gov.sg/Website/IDAhome.nsf/Home? OpenForm).

_____, *Infocomm21* (http://www.ida.gov.sg/Website/IDAhome.nsf/Home? OpenForm).

_____, *Singapore eGovernment* (http://www.egov.gov.sg).

_____, *Survey of Infocomm Usage in Businesses 2000*.

_____, *Survey of Infocomm Usage in Households 2000*.

_____, *Survey on Electronic Commerce 2000*.

Wong, James, and Eric Lam, "Measuring electronic commerce in Singapore: methodological issues and survey findings" (E-Commerce and Official Statistics, Singapore Department of Statistics 2000).